ENERGY CONSUMPTION GUIDE 82

Energy use in Court Buildings

ENERGY CONSUMPTION GUIDE 82

ENERGY EFFICIENCY

BEST PRACTICE PROGRAMME

September 2002

Energy use in Court Buildings

CONTENTS

1 ABOUT THIS GUIDE

This Guide has been produced to help those with responsibility for reducing energy consumption within Court Buildings.

It identifies the factors which influence the amount of energy used with court buildings and in the light of these:

- Defines energy consumption benchmarks for generic court buildings 'types', against which the performance of any particular court building can be measured.
- Highlights the key areas where energy savings can be made in most court buildings.
- Provides concise Case Histories demonstrating energy efficiency Good Practice within existing court buildings.

2 HOW TO CALCULATE THE ENERGY PERFORMANCE OF COURT BUILDINGS

To make use of benchmarks it is important to adjust raw energy consumption data to the same basis as the benchmarks in order to make a like-for-like comparison. There are five major steps.

Step 1

Convert energy units to kWh

Electricity is already measured in kWh but other types of fuel must be converted to kWh so that a common energy unit is used. Conversion factors from Table 2.1 can be used.

Table 2.1 Fuel conversion factors

Fuel	Measured Units	To get to kWh, multiply by
Electricity	kWh	1.0
Natural gas	m^3	10.7
	kWh	1.0
	100 ft^3	30.3
Gas Oil (35 sec)	Litres	10.6
Light fuel oil (290 sec)	Litres	11.2
Medium fuel oil (950 sec)	Litres	11.3
Heavy fuel oil (3500 sec)	Litres	11.4
LPG/Propane	Tonnes	13 780
Coal	kg	9.0

Step 2

Adjust the space-heating energy (fossil fuel) to account for the weather

When the weather is severe a building will use more energy. In order that a reasonable comparison can be made with data from different years, a correction factor is applied. There is an outside temperature called the base temperature (taken to be 15.5°C for most buildings), above which heating is not necessary because of internal heat gains from people, equipment, lighting and solar gain. The space-heating requirement is dependent on the number of 'degree days'.

As an example, if for one week the average outside air temperature was 12.5°C, this would represent a heating requirement for the building (15.5 – 12.5) x 7 = 21 degree days.

In order to calculate the weather correction factor, the total degree days for a standard year are divided by the degree days for the year in which the energy data is to be considered. The standard year is taken to have characteristics that are typical of the last 20 years' average for the UK and this totals 2462 degree days.

$$\text{Weather correction factor} = \frac{\text{Standard degree days (2462)}}{\text{Degree days for energy data year}}$$

All the benchmark figures in this Guide have been calculated from sites throughout the UK. To obtain a standard benchmark they have all been adjusted to standard degree days. For this reason, it important to weather-correct the space-heating element of energy consumed so that calculated performance for any site in kWh/m^2/annum is compared with the benchmark on a like-for-like basis.

Monthly degree days are published for standard regions of the UK.

HOW TO CALCULATE THE ENERGY PERFORMANCE OF COURT BUILDINGS

Step 3

Occupancy correction

The benchmarks for court buildings relate to 55 hours/week occupation. If these hours vary, then a correction factor must be applied both to the fossil-fuel and electricity consumption.

For electrical energy consumption the adjustment should be made on a pro-rata basis for the hours occupied. For fossil-fuels, a separate correction factor is required. For the purpose of this Guide the correction factors shown in Table 2.2 should be used.

Table 2.2 Occupancy correction factors for fossil-fuel consumption

Occupancy Period	Correction Factor
Single shift five days per week	1
Additional 15 hours per week, eg weekend working	0.95
Continuous working (seven-day week)	0.8

Step 4

Determine the floor area

Floor area is defined as:

- **Gross internal area** – total building measured inside external walls
- **Treated floor area** – gross areas, less plant room and other areas not directly heated (eg stores, covered car parking and roof spaces).

In multiple-storey buildings, areas are the combined total of each floor.

Step 5

Calculate performance indicators

Performance indicators for fossil fuel and electricity can now be calculated.

Fossil-fuel performance indicator =

$$\frac{\text{Corrected annual fossil-fuel consumption}}{\text{Treated floor area}} = \text{kWh/m}^2\text{/annum}$$

Electricity performance indicator =

$$\frac{\text{Corrected annual electricity consumption}}{\text{Treated floor area}} = \text{kWh/m}^2\text{/annum}$$

These performance indicators can then be compared with the benchmarks for the relevant laboratory category.

A worked example of this methodology is given on page 4-2.

3 TYPES OF COURTS

For benchmarking purposes, court buildings can be assigned into one of four generic types, namely:

- Type 1: Magistrates Courts
- Type 2: County Courts
- Type 3: Crown Courts
- Type 4: Combined Courts

The characteristics of these four types of court building are summarised as follows:

Type 1: Magistrates Courts

Magistrates Courts are typically housed in simple buildings, with comparatively basic services. They have little if any air-conditioning and generally no catering facilities. Their generally small size means that their specific heating energy use (per m^2 of floor area), is relatively high.

Type 2: County Courts

County Courts are purely for civil justice and are often housed in older type buildings. There will generally be few Judge's Chambers, possibly only two or three. They have little if any air conditioning, generally no catering facilities (except for small domestic type kitchens for staff use, together with vending machines), no custodial areas and the public to staff ratio is likely to be approximately 3:1. The layout is generally open plan with some cellular offices, possibly as few as one or two Courtrooms and associated Chambers, few consulting rooms and limited public areas.

Type 3: Crown Courts

Crown Courts are purely for criminal justice and are frequently relatively new or refurbished buildings, often with substantial air conditioned areas, high luminance levels and large numbers of items of IT equipment. There can be many Judge's Chambers, often more than 10. The staff are generally outnumbered by general public by as much as 8:1 requiring significant public areas. The layout is generally open plan with some cellular offices, Courtrooms and associated Chambers and consulting rooms. Crown Courts also have a custody area and frequently also have catering facilities.

Type 4: Combined Courts

Combined Courts have a combination of both County and Crown Courts although catering facilities are generally limited to domestic type kitchen for staff use together with vending machines. They are generally the largest and most modern courts and these two factors lead to relatively low specific heating energy use (per m^2 of floor area).

THE BENCHMARKS

4

The energy consumption benchmarks against which the energy performance of court buildings should be compared are shown in Table 4.1. Initially, all courts should strive to do better than the 'typical' benchmarks. The 'good practice' values show what can be achieved, particularly within new court buildings.

The benchmark figures have been derived from a statistical analysis of the historical energy consumption performance of 242 court buildings. The 'typical' benchmarks reflect the arithmetic mean for each type of court, while the 'good practice' figures are being achieved (or bettered), by the top 25% of sites.

As such, the benchmarks give an indication of those buildings which have a higher than average energy consumption and hence may justify more detailed investigation. In some cases these investigations will identify opportunities for significant energy savings, while in others there may be legitimate reasons why energy use is high (for example, constraints may be present in Listed buildings). It may not be practical or cost-effective therefore, to achieve 'typical' performance in all court buildings.

	Magistrates (1)		County (2)		Crown (3)		Combined (4)	
	Typical	Good Practice	Typical	Good Practice	Typical	Good Practice	Typical	Good Practice
Total gas or oil	194	125	190	125	182	139	159	111
Total electricity	45	31	60	52	74	68	71	57
Total kWh/m^2 per year	239	156	250	177	256	207	230	168

Table 4.1 Energy consumption benchmarks (kWh/m^2 per year)

Important Notes:
The benchmark figures quoted in Table 4.1 are based on the 'Treated Floor Area' ie the area that is heated.

Approximate conversions for typical courts are:
- Treated floor area = Agent's letting area (ALA) x 1.25
- Treated floor area = Gross internal area (GIA) x 0.95

The benchmark figures quoted in Table 4.1 assume the following:
- Single shift occupation, Monday – Friday, with some limited activity over the weekend. Assumed occupation hours for the building (excluding cleaning and maintenance staff), are taken as 55 hours/week.
- Annual degree days of 2462.

Adjustments will be necessary where the conditions at a particular court differ from these assumptions. See Section 3 and the following worked example.

THE BENCHMARKS

Worked example

Building type:	Type 1: Simple laboratory
Degree days:	2253
Treated floor area:	3,500m^2
Weekly hours of use:	70
Annual electricity consumption:	553 797 kWh/annum
Annual gas consumption:	784 162 kWh/annum

Step 1

Convert energy units to kWh.

Not required.

Step 2

Adjust the space-heating energy (fossil fuel) to account for the weather

The degree day factor is $\frac{2462}{2253} = 1.09$

Corrected gas usage is 1.09 x 696 282 = 758 947 kWh

Step 3

Occupation correction

Correction factor for electricity is $\frac{55}{70} = 0.79$

Correction factor for gas is 0.95 (see Table 2.2)

Step 4

Determine the floor area

Treated floor area = 3500m^2

Step 5

Calculate performance indicators

Fossil-fuel performance = $\frac{758\ 847 \times 0.95}{3500}$ = 206 kWh/m^2/annum

Electricity performance = $\frac{287\ 975 \times 0.79}{3500}$ = 65 kWh/m^2/annum

Compare actual performance with ‘typical’ benchmark performance:

Table 4.2 Comparing actual performance with benchmark performance

	Actual performance (kWh/m^2/annum)	Benchmark performance (kWh/m^2/annum) (see table 4.1)	Improvement needed
Electricity	65	60	8%
Fossil Fuel	232	190	18%

RESPONDING TO POOR PERFORMANCE

5

It is also possible to use benchmarks to help with the initial 'detective work' when analysing the energy performance of a building. This is a particularly useful technique that can help to establish priorities or identify areas for further investigation.

Usually, it is worthwhile examining not just the benchmark for the whole building but also the separate benchmarks for the fossil-fuel and electricity, and their components. Additionally, if areas of the building are sub-metered, calculating the energy performance for these areas can also be helpful.

Table 5.1 presents the expected breakdown of energy usage (kWh/m^2/annum) within each court type.

	Magistrates (1)		County (2)		Crown (3)		Combined (4)	
	Typical	Good Practice	Typical	Good Practice	Typical	Good Practice	Typical	Good Practice
Heating – gas or oil	187	121	181	121	164	125	145	101
Hot water – gas or oil	7	4	9	4	18	14	14	10
Hot water – electric	5	3	6	5	7	6	8	6
Cooling	4	3	4	4	12	11	10	8
Fans and pumps	3	2	4	4	9	8	8	6
Lighting	23	16	32	27	28	26	23	20
Office equipment	6	4	8	7	9	8	10	8
Catering	4	3	6	5	9	9	12	9
Total gas or oil	**194**	**125**	**190**	**125**	**182**	**139**	**159**	**111**
Total electricity	**45**	**31**	**60**	**52**	**74**	**68**	**71**	**57**
Total kWh/m^2 per annum	**239**	**156**	**250**	**177**	**256**	**207**	**230**	**168**

Table 5.1 Breakdown of energy use within each court type (kWh/m^2/annum)

Further analysis of a building's half-hourly electrical demand profiles (typically available for sites with a maximum demand greater than 100 kW and sometimes for smaller sites), or night time electricity consumption compared with the daytime usage, etc, can help to maximise the benefits from site investigation. This type of analysis can indicate areas of wastage, or even the specific time of day that requires further investigation.

RESPONDING TO POOR PERFORMANCE

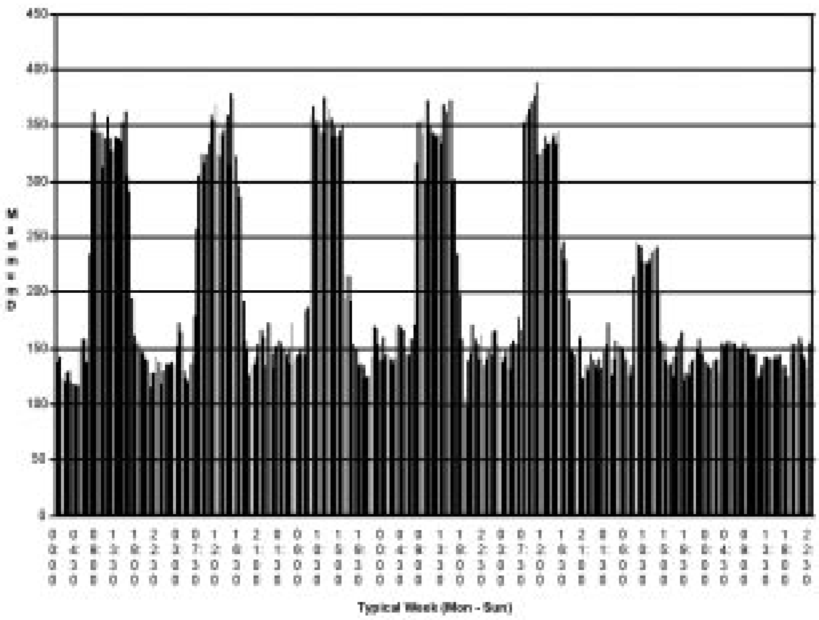


Figure 1 Typical electrical demand profile

Figure 1 shows a typical weekly electrical demand profile for a building working single shifts. The weekday peaks in consumption of the data might prompt the following questions:

- How quickly and effectively are lights etc. turned off at the end of the working day?
- Is the use of electricity on Saturday legitimate?
- Why is there such a substantial residual overnight electrical load?

It is also sometimes worthwhile installing temporary monitoring equipment on main electrical loads, eg air-conditioning plant etc, to help to understand their power requirements.

Further guidance is provided in 'Good Practice Guide 311, Detecting Energy Waste – a guide for energy audits and surveys in the Government estate'.

6

SAVINGS OPPORTUNITIES – LAGANSIDE COURTS

Savings are potentially available across the full range of court building energy uses. Information sheets are included at the rear of this Guide which describe the principal savings opportunities in the following areas:

Information Sheet 1:	Boilers and boiler control
Information Sheet 2:	Heating controls
Information Sheet 3:	Domestic hot water
Information Sheet 4:	Lighting
Information Sheet 5:	Air-conditioning
Information Sheet 6:	Water usage
Information Sheet 7:	Staff awareness campaign
Information Sheet 8:	Good housekeeping
Information Sheet 9:	Refurbishments
Information Sheet 10:	Check list

Each opportunity is keyed to indicate whether it is:

- A no-cost measure, capable of easily being carried out by competent staff.
- Servicing/repair of plant or equipment.
- A low-cost item, funded at local level (often self-funded).
- A high-cost measure, likely to require capital funding (eg from a departmental budget).

In all cases, priority should be given to the simple no-cost and low-cost opportunities (for example turning lights off when not required). Individually, these issues can appear insignificant, but it is often easier, for example, to identify 20 small saving measures each worth ½%, than one large measure worth 10%.

The following three Case Histories illustrate how these energy saving ideas have been applied to a diverse range of court building types.

Case History 1 – Laganside Courts

The new Laganside Courts in Belfast were first occupied in December 2001 having been designed, financed and built under a PFI contract.

Energy efficiency featured heavily in the Northern Ireland Court Service's requirements and the building incorporates many advanced features.

The building has 16 court rooms (providing Crown, County and Magistrates facilities), and flexibility in use is a key requirement. The building's services (heating, air conditioning, lighting etc.), have therefore been zoned to allow independent time and temperature control. This feature has been applied not only to the court rooms themselves, but also to their associated retiring rooms and public areas.

Additional temperature zone control has even been provided within the larger court rooms themselves, with independent re-heat batteries being provided for:

- The judge's bench
- The jury
- The dock
- The public area

In total the building has 26 air handling units (AHU's) and overall control is achieved via a Building Energy Management System (BEMS).

Part of the Court Service brief was that the building should achieve a 'very good' rating in an independent BREEAM assessment.
This was achieved by using innovative energy efficiency solutions such as:

- Variable fresh air intake, based on air quality detection
- Variable speed drives on air handling unit fans and pump motors

SAVINGS OPPORTUNITIES – TEESIDE COMBINED COURT

- The use of ‘free cooling’ whenever possible (including ‘night purge’ programming via the BEMS)
- Ventilation plant heat recovery using a thermal wheel
- Light wells, designed to reduce the need for artificial light
- Automatic lighting controls (based on occupation detection)
- Motorised blinds to reduce solar heat gains and hence air-conditioning loads (controlled via the BEMS)

Overall, the building represents a good example of what can be achieved in a cost effective manner within a modern Court building.

Case History 2 – Teeside Combined Court

Teeside Combined Court, in Middlesborough, was built in 1991 and houses 11 Crown and two Civil court rooms.

The court rooms are fully air-conditioned (including humidity control), and so the building is potentially a high energy user. To counter this, the building is zoned and controlled by a sophisticated Building Energy Management System (BEMS).

There is the recognition on site, however, that a BEMS is not simply a ‘fit and forget’ device.

Instead, it is a tool that must be proactively used by building management staff, if energy use is to be driven down.

Court Services staff have therefore developed a strong working partnership with their resident maintenance contractor, which is seen as an essential requirement for effective energy management, and this is manifested in:

- Good communication
- Senior Court Service management support

Good communication is required to ensure that the operating times of the air-conditioning plant are closely matched to actual requirements. Each day’s planned sitting times are given to the maintenance contractor by 16.00hrs on the preceding day and this allows him to programme them into the BEMS. This includes appropriate ‘off’ periods for the lunchtime recess.

Should circumstances subsequently change (for example if a sitting is cancelled or curtailed), then this is communicated to the maintenance engineer by radio, allowing him to adjust the BEMS time settings at the earliest opportunity.

Senior management support is required to encourage the maintenance contractor in his

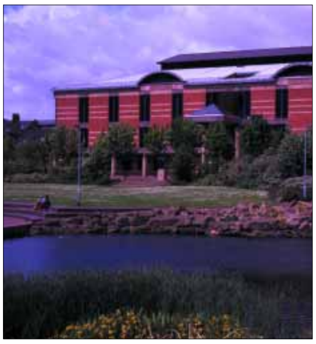
SAVINGS OPPORTUNITIES – MIDDLESEX CROWN COURT

efforts to 'fine tune' the BEMS temperature and humidity control set points.

Experience has shown staff at Teeside Combined Court, that the building's operating temperature can be allowed to drift down in winter (thereby reducing heating energy use), and allowed to drift upwards in summer (thereby reducing cooling). This can have a significant impact on energy use (for example a 1°C reduction in winter room temperatures, gives an approximate 10% energy saving).

Similarly, humidity levels are allowed to drift from 40% in winter to 70% in summer, thereby reducing humidification and de-humidification costs respectively.

Establishing these acceptable limits required concerted experimentation by the maintenance contractor and, inevitably, at times things were taken slightly too far and some staff complaints were generated. Under these circumstances, the support of the Court's senior management was vital.



Case History 3 – Middlesex Crown Court

Middlesex Crown Court is housed within the historic Middlesex Guildhall, on Parliament Square in London. It is a Grade 1 listed building and this presents particular challenges when managing energy use.

Lighting is a case in point

Most areas of the building are lit using decorative pendant fittings, and when the building was refurbished in 1988 it was a requirement that these should be retained. As originally installed, however, the fittings used 60W tungsten filament (GLS) bulbs which had extremely high running costs, due to their poor energy efficiency and short lamp life. Typically, the court was having to change 300 – 400 bulbs every month.

As part of the refurbishment works, it was decided to replace the 60W tungsten filament bulbs with 15W compact fluorescent lamps (CFLs) which, in addition to only using 25% of the power, also last on average eight times as long. Whilst the CFL bulbs were substantially more expensive to buy than the traditional tungsten filament bulbs, the resulting savings in electricity use and bulb change labour made a strong economic case.

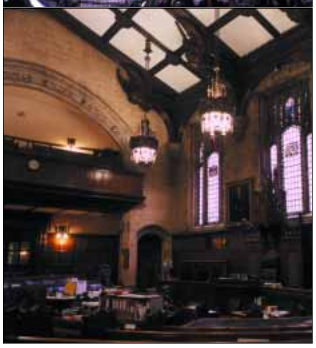
There was a problem, however, because the proposed CFL bulbs were slightly longer than the original tungsten filament ones and hence protruded from the shades by around 15 mm, spoiling the aesthetic appearance. It was therefore decided to commission the manufacture of new glass shades which, while retaining the appearance of the originals, were subtly longer and completely shielded the CFL bulbs. A purpose built tool was also made to help bulb changing.

Attention was also paid to the control of the lighting. All courtroom lighting is switched remotely from a panel located within the Security Officer's room. Standard operating procedures were therefore put in place so that any particular Court Room's lights are only switched on when its keys are drawn by the Usher. Similarly, Ushers have been educated to return the keys as soon as possible after a sitting has finished, thereby prompting the lights to be turned off.

General staff energy awareness has been tackled by a variety of issues including:

- Senior management support
- The adoption of a '10 Point Energy Plan'
- The production and distribution to all staff of an in-house guide to saving energy at work and at home
- Close monitoring of energy use and working practices (for example, the routine early evening security sweep includes feedback on any inappropriate lighting found left on).

Overall, the Court's refurbishment and on-going attention to energy management has reduced annual energy costs from around £40 000 per year to nearer £20 000 per year.



FURTHER INFORMATION

The following publications are available from Action Energy – (formerly the Energy Efficiency Best Practice programme).

ECON 75 'Energy use in Ministry of Defence establishments'
ECON 83 'Energy use in Government Laboratories'
GPG 84 'Managing and motivating staff to save energy'
GPG 117 'Energy efficiency in the Government Estate – for accommodation managers
GPG 118 'Managing energy use. Minimising running costs of office equipment and related air-conditioning'
GPG 276 'Managing for a better environment. Minimising running costs and impact of office equipment'
GPG 310 'Degree days for Energy Management – a practical introduction'
GPG 311 'Detecting energy waste – a guide for energy audits and surveys in the Government Estate'
GPG 312 'Invest to save? Financial appraisal of energy efficiency measures across the Government Estate'
GPG 320 'Energy efficient operation and design of fume cupboards'

FURTHER READING

Chartered Institution of Building Services Engineers (CIBSE)

- Applications Manual (AM) 5. Energy Audits and Surveys CIBSE, London, 1991
- CIBSE Guide. Energy Efficiency in Buildings. CIBSE, London, 1998

This document is based on material drafted for Action Energy by Briar Associates under contract to the BRE's Sustainable Energy Centre (BRESEC).

1

BOILERS AND BOILER CONTROL

Combustion
When monitoring combustion, the aim is to achieve the minimum excess air required for complete combustion of the fuel. This involves ensuring that the CO_2 content of the flue gas is the maximum possible and the oxygen (O_2) content is the minimum possible for a given firing rate, consistent with maintaining a smoke-free stack. The flue-gas temperature should be as low as possible without causing condensation of moisture and sulphur oxides.

Key saving
Regularly monitor boiler combustion efficiencies and set target efficiencies for the servicing contractors.

Boiler installation
The heat loss due to radiation from a modern boiler may represent only 1.5% of the boiler's output at full load, but will increase to about 6% if the boiler is operating at only 25% load.

Key saving
Insulate poorly insulated boiler plant.

Off-line flue losses
The installation of a flue-gas damper or a fully closing damper on the burner will minimise the convection heat losses through a boiler when it is not firing.

Key saving
Prevent convection losses through boiler.

Boiler sequencing
The highest boiler efficiencies typically occur between 70% and 90% of the rated firing capacity. Therefore, the boiler efficiency should be kept high by firing the boilers in this range for as much time as possible. Effective boiler sequence control enables only the minimum number of well-loaded boilers to operate to meet the system demand.

Key saving
Use boiler sequencer on multiple boiler installations.

This Information Sheet forms part of ECON 83 ‘Energy use in Court Buildings’ and has been produced by BRE’s Sustainable Energy Centre (BRESEC) for Action Energy – formerly the Energy Efficiency Best Practice programme.

2

HEATING CONTROLS

TIME CONTROL

Time switches

These bring the plant on and off according to set times of the day. These simple devices should only be used for installations below 100 kW. A resolution of better than 15 minutes should be used and where occupancy hours differ between weekdays and weekends a seven-day time switch should be used.

Optimisers

Optimiser controls are suitable for most intermittently heated buildings with an installed heating capacity greater than 100 kW.

Key saving

Ensure that time settings match the occupancy requirements and on larger installations use an optimiser.

Compensators

In a compensated system the flow temperature in the heating circuit is controlled relative to the external temperature. If a building is frequently overheated then the compensator slope may need adjusting.

Key saving

Check compensator settings.

Night set-back temperature

The night set-back temperature is the heating set point for periods outside normal occupancy times. For most office buildings in the UK, a night set-back of approximately 10°C is sufficient.

Key saving

Check night set-back temperature is appropriate.

Local controls

Where local controls are fitted eg thermostatic radiator valves (TRVs), zone valves, etc, it is important that their correct operation is checked as a minimum at the beginning of each heating season. Where TRVs are installed ensure that they are used correctly and not left on 'max'.

Key saving

Check operation of local controls.

Heating systems

All heating systems should be checked at least once per heating season (but preferably twice – once at the start and then again at the middle of the season) by utilising independent (ie not BMS-associated boiler controls that lend themselves to interrogation) portable instruments. These can be simple mechanical devices such as thermoscripts or electronic devices requiring a PC interface. Essentially they should provide a copy (hard or electronic) of the performance of the heating or air-conditioning systems showing the on/off times and space temperatures attained, over a period of, say, 2 weeks. Dependent on the recordings received, controls should then be re-set as shown to be necessary.

Ensure that heating within Court areas is matched to use (ie not switched on too early or left on after hours or during recesses etc).

Key saving

Check operation of local controls.

This Information Sheet forms part of ECON 83 'Energy use in Court Buildings' and has been produced by BRE's Sustainable Energy Centre (BRESEC) for Action Energy – formerly the Energy Efficiency Best Practice programme.

3

DOMESTIC HOT WATER (DHW)

Central or decentralised DHW production

During the summer months up to 90% of the energy used for providing hot water from central boiler/calorifier systems can be due to losses and inefficient generation. Considerable savings can be made by totally segregating generation of hot water from the heating system or by decentralising hot water provision to point-of-use systems.

Key saving

Consider decentralising hot water provision.

Direct-fired water heaters

These units are inherently more efficient than boiler/calorifier systems as the water is heated directly. The potential for savings by the correct application of direct-fired water heaters is up to 50%.

Key saving

Consider direct-fired water heaters.

Electric Water Heating

Large storage cylinders that are fitted with electric immersion heaters and built-in thermostats should be time-controlled as required. It is important to take advantage of any night-rate electricity tariff to minimise running costs.

Key saving

Ensure correct time and temperature control of immersion heaters.

Point of use electric water heaters can be very economical. It is, however, important to apply time controls to units that have high standing losses ie the casing is hot to touch.

Key saving

Fit seven-day time controls where standing losses are high.

Standing Losses

Hot water storage and distribution systems should be adequately insulated to prevent high standing losses.

Key saving

Ensure all lagging is in good condition and thick enough.

Time Controls

In intermittently occupied buildings, hot water storage and distribution systems should be time-controlled. It is, however, important to avoid legionella formation and that the time settings match occupancy (for full guidance see CIBSE Technical Memorandum 13). This may necessitate the use of a time switch separate to that used for controlling the building's heating.

Key saving

Ensure good time and temperature control of DHW that matches demand patterns.

Tea Points

Due to the high standing losses from electric tea-point water boilers, time controls should always be fitted.

Key saving

Ensure all electric water boilers are time-controlled by seven-day time switches.

This Information Sheet forms part of ECON 83 'Energy use in Court Buildings' and has been produced by BRE's Sustainable Energy Centre (BRESEC) for Action Energy – formerly the Energy Efficiency Best Practice programme.

4

LIGHTING

Lamp Efficacy *

Filament lamps (eg normal light 'bulbs') are the most inefficient type of light source as evidenced by the waste heat they produce. As such, filament lamps generally have a low efficacy.

Discharge lamps (eg fluorescent tubes, sodium lamps, etc) are between four and fifteen times more efficient than filament lamps.

Where possible, use high-frequency fluorescent light fittings as they have a higher efficacy than standard fluorescent fittings.

Key saving

Use the highest-efficacy lamp possible eg use compact fluorescent lamps in place of tungsten filament lamps.

*** Note:** Lamp efficacy is the lumens output for the consumed electrical energy (watts). Filament (incandescent) lamps are of low efficacy because their lumens output is relatively low compared to the electricity consumed. Fluorescent lamps have a higher efficacy than filament lamps, producing more lumens output for a lower electrical consumption.

Manual Lighting Control

Switching arrangements should at least permit individual rows of luminaires parallel to windows to be controlled separately. Switches should be located as near as possible to the luminaires that they control. If groups of switches are used, simple labels should aid manual control.

Ensure that lighting within Court areas is matched to use (ie not switched on too early or left on after hours or during recesses etc.). The switching off of lighting within Judge's Chambers is also a particular issue.

Key saving

Encourage manual control of lighting wherever possible.

Automatic Lighting Controls

Photoelectric control ensures that lighting will be turned off when the daylight provides the required illuminance. Where high-frequency fluorescent lighting is installed, consider using photoelectric controls to dim the light output when ambient light levels allow.

Proximity controls are designed to respond to the presence or absence of occupants, they can be particularly effective in intermittently occupied rooms such as Custody areas, public toilets etc.

Key saving

Install automatic lighting control wherever viable.

Illumination Levels

Illumination levels are often for higher than Court Standards, leading to an over-consumption of electricity.

Key savings

Have illumination levels checked and selectively de-lamp fittings where appropriate.

This Information Sheet forms part of ECON 83 'Energy use in Court Buildings' and has been produced by BRE's Sustainable Energy Centre (BRESEC) for Action Energy – formerly the Energy Efficiency Best Practice programme.

5

AIR-CONDITIONING AND MECHANICAL COOLING

Air-conditioning is the combination of refrigeration and humidity control (often within a warm air heating system), that provides air that meets certain quality parameters. Mechanical cooling provides temperature control only (via refrigeration plant), and is frequently applied on a room-by-room basis using ceiling or wall mounted cassette units.

There are a number of key questions that need to be considered when operating air-conditioning or mechanical cooling:

- Is air-conditioning actually necessary or would improved ventilation be adequate?
- Can 'free-cooling' by outside air be provided for some of the year instead of mechanical cooling?
- Is it possible to separate all-year cooling requirements, such as communication equipment, from summertime-only comfort-cooling requirements?
- Can cool air be recovered in the summer as well as hot air being recovered in the winter?

Time Control

Time control of air-conditioning plant is very important. This control must apply to all elements of the system ie the refrigeration plant, fans, pumps, humidifiers etc.

Key saving

Ensure good time control of all system elements to match occupancy patterns.

Temperature Control

Over-cooling is extremely wasteful. It is recommended that the cooling set point in a court is not more than 3°C below the ambient temperature. As such, with an ambient temperature of 27°C the cooling set point is 24°C . If the ambient temperature increases to 29°C then the cooling set point is raised to 26°C.

Key saving

Vary the cooling set point depending on ambient conditions.

Cooling and Heating

A very common cause for waste is when the building's heating system is operating at the same time as the air-conditioning. It is, therefore, important to ensure a dead band of at least 3°C between the heating and cooling set points. This will prevent the heating and cooling systems 'fighting' each other.

Key saving

Ensure a minimum 3°C dead band between heating and cooling set points.

Communication Rooms

Many communication rooms are continually air-conditioned to, say, 18°C. Many modern items of communication and computing equipment have been designed to operate at ambient conditions of up to 35°C. Some studies also indicate that cycling the temperature within communication rooms by 2°C or 3°C makes the equipment less susceptible to failure if there is a slight change in environmental conditions.

Key saving

Only air-condition if absolutely necessary.

typical saving opportunities

This Information Sheet forms part of ECON 83 'Energy use in Court Buildings' and has been produced by BRE's Sustainable Energy Centre (BRESEC) for Action Energy – formerly the Energy Efficiency Best Practice programme.

WATER USAGE

Water consumption should be analysed in the same way as that for electricity and fuel usage, ie against installed equipment and invoice information. Regular meter reading should be undertaken if invoice information is not available. This will highlight any unexplained changes in consumption and may indicate leakage.

Water Saving Devices

Tap restrictors are useful for providing equal flow at a number of taps in a wash room. Typically, they reduce water flow by up to 15%. Push taps are ideal for public areas where taps may be left running.

Key saving

Where possible, reduce water consumption at hand basins.

Urinal Flush Controls

Urinal flush controls limit the flushing from the traditional continually flushing cisterns. These controllers prevent water usage when urinals are unused for long periods but they include a periodic 'hygiene' flush.

Key saving

Fit urinal flush controls.

Waterless Urinals

Waterless urinals are becoming more popular as the technology improves. They should, however, only be used where there is a reliable cleaning regime.

Key saving

Consider installing waterless urinals.

This Information Sheet forms part of ECON 83 'Energy use in Court Buildings' and has been produced by BRE's Sustainable Energy Centre (BRESEC) for Action Energy – formerly the Energy Efficiency Best Practice programme.

STAFF AWARENESS CAMPAIGN

There is a much greater chance of minimising energy costs if building occupants are thinking about it on a regular basis. Awareness campaigns should set out the roles and formal responsibilities of the individuals selected to achieve management targets. These tasks should be built into individual job descriptions.

Why Don't People Save Energy?

There are five fundamental reasons why people do not save energy:

- they are not aware of the need to save energy
- they do not recognise their role
- they do not know where to save
- they do not know how to save
- they are not motivated to save.

The way to overcome some of these barriers is to change people's attitudes and give them a sense of responsibility for energy usage. By increasing their awareness and providing technical assistance this can be achieved.

Awareness Techniques

There are a number of key methods that can be used to improve the awareness of staff. They are:

- talking to people (individually)
- awareness talks (groups)
- publicity ie posters, energy/environmental display boards, newsletters etc.
- competitions
- training
- energy wardens
- regularly circulating energy performance figures.

Improving Motivation

The most successful way of improving motivation is to offer some kind of incentive or reward as a bonus in people's pay packets. Any savings may be maximised by introducing some form of interdepartmental competition. This form of competition helps to create a positive goal and promotes a team spirit amongst the participants and can also attract positive publicity. The more people that are aware, the greater the chance of reducing energy costs.

For further information please refer to GPG 84 'Managing and motivating staff to save energy'.

GOOD HOUSEKEEPING

Office Equipment

Office equipment can typically account for up to 20% of the energy used in the office spaces associated with court buildings. Good management of office equipment can create worthwhile energy savings. For further information, please refer to GPG 118 'Managing energy use. Minimising running costs of office equipment and related air-conditioning' and GPG 276 'Managing for a better environment. Minimising running costs and impact of office equipment'.

Manual Switching Off

Staff should be encouraged to switch off equipment whenever it is not being used, providing it is cost effective to do so. This is particularly applicable to computer screens as they can be switched off while the computer itself remains on. There are, however, times when it can take too long to bring some equipment back into operation (eg large photocopiers etc) for it to be cost-effective to switch them off for relatively short periods.

Key saving

Where possible, all equipment should be switched off during lunch hours, at night and at weekends, unless specifically required, eg network servers, equipment connected to outside line modems etc.

Energy-Saving Features

Energy-saving features built into office equipment (eg Energy Star compliant equipment) should be enabled. These features typically include:

- automatic standby mode
- automatic switch off.

Key saving

All equipment should have energy-saving features enabled. If Energy Star equipment is purchased, it is essential that the software is set up correctly on each machine, otherwise the initial extra capital cost would have been in vain!

Popular misconceptions

'Switching off fluorescent lights costs more than leaving them switched on'

NO!

If a fluorescent light is not required, it is always more efficient to turn it off rather than leave it on.

'Computer screens in 'screen saver' mode save energy'

NO!

When a computer screen is in 'screen saver' mode it does not save any energy. Screens should be turned off rather than leaving them in screen saver mode.

'Turning off personal computers can damage the equipment and lose valuable data'

NO!

A personal computer should always be turned off when left unattended for more than, say 30 minutes. Turning it on and off does not cause damage.

This Information Sheet forms part of ECON 83 'Energy use in Court Buildings' and has been produced by BRE's Sustainable Energy Centre (BRESEC) for Action Energy – formerly the Energy Efficiency Best Practice programme.

REFURBISHMENTS

Energy efficiency measures can often be incorporated during refurbishment works at marginal extra cost. Such opportunities should not be missed.

Roofs

Insulating pitched roofs at ceiling level gives a good rate of return at any time.

Flat roofs should be insulated during refurbishment work.

Older buildings often have high ceilings. Installing a new false ceiling with insulation at ceiling level can reduce the heated volume.

Walls

Where external surfaces of walls require attention for structural or other reasons, insulating the wall at the same time should be considered.

Addition of insulation to the internal face of external walls should be carried out during refurbishment to minimise the potential disruption to occupants.

If internal refurbishment is to be carried out, adding insulation between timber studs or using a composite board should be considered.

Floors

Where there is access to the underside of suspended timber floors, adding insulation between the joists is cost-effective.

Where existing solid floors need to be renewed, this is an opportunity to add insulation.

Windows

Where window frames are in poor condition and need replacing, consider installing 4-12-4 double glazing with a low-emissivity (low-e) coating.

Many post-war court buildings were designed with a large area of single glazing. During refurbishment, consideration should be given to replacing some of the low-level glazing with insulated panels.

Where control of solar gain is required, the installation of external shading devices should be considered.

Doors

Providing a draft lobby at frequently used entrances to a building can make a significant contribution to reducing ventilation heat loss.

Lighting

When fluorescent lighting is being replaced, consideration should be given to using high-frequency fittings.

When new lighting is being installed, ensure that all control options are considered and that sufficient manual switches are provided.

Heating

Where a building under refurbishment is a long way from a central boiler house, decentralisation may be appropriate.

Good controls are an important part of energy management. It is recommended that, as far as possible, controls are made tamper-proof and should include time switches, optimisers, compensator, TRVs, zoning, etc.

Any redundant pipework should be isolated or removed.

This Information Sheet forms part of ECON 83 ‘Energy use in Court Buildings’ and has been produced by BRE’s Sustainable Energy Centre (BRESEC) for Action Energy – formerly the Energy Efficiency Best Practice programme.

CHECKLIST

10

Regular activities

- [ ] Read all utility meters, ideally monthly
- [ ] Monitor consumption and compare with previous performance
- [ ] Report/publish performance

Checks for energy waste when a building is occupied

- [ ] Are areas suffering from overheating or excessive cooling?
- [ ] Are the lights off in unoccupied areas?
- [ ] Are lights off when daylight is sufficient?
- [ ] Are light fittings clean?
- [ ] Are windows and doors open when the heating/air conditioning is on?
- [ ] Is office equipment left on at unoccupied workstations?
- [ ] Are portable electric heaters in use?
- [ ] Are there obstructions in front of radiators or heaters?
- [ ] Are blinds being used to minimise solar gain in air conditioned areas?
- [ ] Are taps dripping?
- [ ] Is external or security lighting on during daylight hours?

Checks for energy waste outside normal occupancy

- [ ] Are all lights switched off?
- [ ] Do cleaners switch off all lights?
- [ ] Are doors and windows closed?
- [ ] Are all fans switched off?
- [ ] Are there any items of office equipment left on?
- [ ] Are vending machines switched off?

For further information please refer to GPG 117 'Energy efficiency in the Government Estate – for accommodation managers'.

typical saving opportunities

This Information Sheet forms part of ECON 83 'Energy use in Court Buildings' and has been produced by BRE's Sustainable Energy Centre (BRESEC) for Action Energy – formerly the Energy Efficiency Best Practice programme.